Enzyme Kinetics Lecture

$$E + S \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} ES \xrightarrow{k_2} E + P$$

① $v = \frac{d[P]}{dt} = k_2[ES]$ – Product formation

② $\frac{d[ES]}{dt} = k_1[E][S] - k_{-1}[ES] - k_2[ES]$

enzyme conservation

③ $\boxed{E = E_0 - ES}$

enzyme is a catalyst
Catalysts are not consumed by react.

Quasi Steady State assumption (QSSA)

$\frac{d[ES]}{dt} \approx 0 \rightarrow$ (2 w/ QSSA) + (3)

2 w/ QSSA $0 = k_1[E][S] - k_{-1}[ES] - k_2[ES]$

③ $E = E_0 - ES$

---

④ $[ES] = \frac{k_1([E_0] - [ES])[S]}{k_{-1} + k_2}$

↓

Solve for $[ES]$

Plug ⑤ into ①

⑥ $$\frac{d[P]}{dt} = v = \frac{V_m [S]}{K_m + [S]}$$ **

$$V_m = k_2 [E_0]$$

$$K_m = \frac{k_{-1} + k_2}{k_1}$$

extracting experimental parameters

See presentation